South Dakota
Department of Game, Fish and Parks

An Educator's Curriculum and Resource Guide for

The South Dakota Breeding Bird Atlas 2

Guide created by Jennifer A. Fowler
SD GF&P Wildlife Diversity Small Grant Project, 2017

SDBBA2 Final Report published by Bird Conservancy of the Rockies (Rocky Mountain Bird Observatory)

SDBBA2 Interactive Website: SD GF&P

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SDBBA2 : Preface

Welcome to the Educator's Curriculum and Resource Guide for *The South Dakota Breeding Bird Atlas 2.* This supplement can be utilized by the classroom teacher to increase awareness of breeding birds and their distribution within South Dakota. It is a quality product that is ready to use in the classroom to meet selected secondary science standards. The materials can easily be adapted for any K-12 lessons.

This guide is a Microsoft Word document and has been designed for photographs to be copied and pasted into worksheets and PowerPoint presentations for various classroom activities. Permission has been granted for each of the photos in this resource guide and may be used for educational purposes in the classroom provided credit is noted to the photographer.

The activities provided are not detailed, instead they include a list of ideas to choose from to make planning easier and allows for individuality. Active hotlinks are provided to websites with search words for each link should it become inactive. Species accounts in this guide are current as of December 2017. Understand that species information and an agency's management regulations may change over time.

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One of the joys of teaching is having summers available for professional development, and during the SDBBA2 data collection years I spent my time as a paid field technician. My passion for birds and love for fieldwork fueled the days of walking the forests and grasslands of Western South Dakota. From Harding County south to Fall River County I encountered nature at its finest when the world is literally buzzing and the birds are busy creating nests, singing on territory, and breeding to secure their species' survival.

Thank you to all the landowners that allowed me, and the other atlasers across SD, onto their land to wander around and search for all species of birds to make our "book of maps." I would show them the Atlas published twenty years earlier and they were excited to point me in the direction of great habitat on their land and shared stories about birds seen over the years. I was trusted to open and close gates and walk through pastures with cattle, and I was successful each time. Fortunately, my prairie rattlesnake encounter happened toward the end of the project!

I also spent many fulfilling days on our public lands including Black Hills National Forest, Custer National Forest, and Buffalo Gap National Grassland. When I need a "happy place" I often find myself daydreaming that I've returned to these diverse habitats. Thunderstorms on the prairie, wolf spiders carrying babies, and being watched by elk are great memories!

Enjoy traveling throughout South Dakota as you join your students on their avian adventure. These virtual field trips will lead you to various habitats of our state and hopefully inspires exploration! Make plans to get outside and create memories with a hobby that lasts a lifetime!

~ Jennifer Fowler, Science Teacher at South Middle School in Rapid City, SD

SDBBA2 : What is an Atlas?

What is an atlas?
A comprehensive survey of a state's breeding birds' distribution and abundance is compiled into a breeding bird atlas. It can be referred to as a "book of maps" and is often in print and digital. The areas surveyed in our atlas are called blocks and each of the 433 blocks are 3 miles x 3 miles and scattered across the state. Consult the final report for more details.

What is the SDBBA2?
The second South Dakota Breeding Bird Atlas has been compiled into a final report which the interactive website is based on. Data collection was conducted during the breeding seasons of 2008 through 2012. The breeding season "safe dates" for most species of birds is May through mid-July but some like owls, gray jays, and red crossbills breed earlier in March. (See the appendix of the final report) The first SDBBA was conducted 1988 through 1993. It is suggested that a state create a breeding bird atlas every 20 years to note trends in bird populations and habitat changes.

Who participates in "atlasing?"
Rocky Mountain Bird Observatory (now named Bird Conservancy of the Rockies) and South Dakota Game Fish and Parks are responsible for the planning, execution, and completion of the SDBBA2. Aside from paid technicians visiting the atlas blocks, many volunteers dedicated their time to this great example of citizen science.

What exactly is "atlasing?"
Someone who is skilled in identifying wild birds by sight and sound is called a birder. They are assigned atlas blocks to investigate and identify as many species of birds within each 9-square mile block. Part of the fun of atlasing is using maps of the blocks to determine what habitat is present, what access there is to the blocks, and who to contact for access if it is located on private land. Much of this reconnaissance is completed before heading into the field using maps, internet, and visits to county courthouses to determine land ownership. Once in the field with binoculars and spotting scope, early mornings are the best for listening and watching around forest and prairie. Midday is perfect for visiting water areas for shorebirds and waterfowl. Evenings are dedicated to finding owls and planning subsequent days by calling landowners, looking for access to blocks, and entering data from field notes into spreadsheets. Bird species name, GPS location, habitat type, and highest breeding code were recorded while in the field. The SDBBA2 is the compilation of over 7000 hours data collection time!

Why would a bird species be possible or probable for breeding but not confirmed?
Examples include hearing several grasshopper sparrow males singing but not seeing them carry food, mate, find a next with eggs in it, etc. Perhaps there was bad weather so the atlaser could not stay longer to confirm breeding. Maybe a bird was flying over the block and was not relocated.

SDBBA2 : Hints for using this guide…

Have students explore the final draft and interactive website to ask their own questions. What trends, patterns, and phenomena to they notice?

Find the activities that are tied to your standard to be covered.

Skip around and use the parts your like. This guide is intended to be a resource full of ideas!

The activities are not all inclusive. They are a brainstorm to fuel you and your students into more research and discovery!

Some activities match our old 2005 SD Science Standards but offer important skills and information… I call them "Supplemental Science Skills"

All the activities can be modified to any grade level based on the depth of the skills and information you need to cover.

This is a guide that is never completed as there are endless directions for dialog and research at your local level and beyond! Let your students help drive the lessons!

HAVE FUN!!!
You are inspiring the next generation of scientists and land stewards!

How about using the SDBBA2 for studying local geology, weather, and climate!

SDBBA2 : Birding Resources

SD Breeding Bird Atlas information:
SDBBA2 Interactive Website
SDBBA2 Final Report PDF

Environmental Education Curriculum Guides:
Contact SD Coordinators for workshop information.
SD Project Learning Tree
SD Project WILD (Aquatic WILD and Flying WILD)
SD Project WET
SD Leopold Education Project

Local Organizations/Resources:
SD GFP- Things to do- Birdwatching Regional Bird Guides
SD GFP- Birds
South Dakota Ornithologists' Union This site is the portal for info regarding SD birds! AND the new SD checklist!!!
Sioux Falls Bird Club Attend a meeting, field trip, or have them come visit your classroom!
Northern Hills Bird Club Attend a meeting, field trip, or have them come visit your classroom!
Bird Conservancy of the Rockies Apply to be a technician with ongoing research in SD
SD Game, Fish and Parks Wildlife Diversity Program Resource for SD's rare and endangered species
SDOU Online Seasonal Bird Observation Report System Database to search and report SD bird sightings
US Fish and Wildlife Service: Mountain-Prairie Region
US Geological Survey Northern Prairie Wildlife Research Center
National Park Service: Nature and Science

Bird Monitoring Opportunities:
Great Backyard Bird Count administered by The Cornell Lab of Ornithology and The National Audubon Society
Project Feeder Watch administered by The Cornell Lab of Ornithology
Christmas Bird Counts administered by The National Audubon Society
Breeding Bird Surveys administered by U.S. Geological Survey

Publications:
Backyard Birds of South Dakota. 2009. South Dakota Department of Game, Fish and Parks.
Birds of South Dakota. 2002. South Dakota Ornithologists' Union.
The South Dakota Breeding Bird Atlas. 1995. Richard Peterson. SD Ornithologists' Union

SDBBA2: Elementary Science Standards

Using this Resource Guide for *SDBBA2*, portions of the following South Dakota Science Standards, adopted by the SD DOE on May 2015, may be met. A teacher's use of this guide may also accomplish other interdisciplinary standards not included in this list.
SD Science Standards http://doe.sd.gov/contentstandards/

Elementary Life Science Standards included in this guide:

K-LS1-1 Describe patterns of what plants and animals (including humans) need to survive. (SEP: 4; DCI:LS1.C; CCC: Patterns)

2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats. (Systems) (SEP: 3; DCI: LS4.D; CCC: Systems)

3-LS3-2 Use evidence and reasoning to support the explanation that traits can be influenced by the environment. (SEP: 6; DCI: LS3.A, LS3.B; CCC: Cause/Effect)

Elementary Earth Science Standards included in this guide:

K-ESS3-1 Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. (SEP: 2; DCI: ESS3.A; CCC: Systems)

K-ESS3-3 Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.* (SEP: 8; DCI: ESS3.C; ETS1.B; CCC: Cause/Effect)

3-ESS2.2 Obtain and combine information to describe climates in different regions of the world. (SEP: 8; DCI: ESS2.D; CCC: Patterns)

4-ESS2-2 Analyze and interpret data from maps to describe patterns of Earth's features. (SEP: 4; DCI: ESS2.B; CCC: Patterns)

5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. (SEP:8; DCI: ESS3.C; CCC: Systems)

SDBBA2: Middle School Science Standards

Using this Resource Guide for *SDBBA2*, portions of the following South Dakota Science Standards, adopted by the SD DOE on May 2015, may be met. A teacher's use of this guide may also accomplish other interdisciplinary standards not included in this list.
SD Science Standards http://doe.sd.gov/contentstandards/

Middle School Life Science Standards included in this guide:

MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. (SEP: 4; DCI: LS2.A; CCC: Cause/Effect)

MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. (SEP: 6; DCI: LS2.A; CCC: Patterns)

MS-LS4-4 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. (SEP: 6; DCI: LS4.B; CCC: Cause/Effect)

Middle School Earth Science Standards included in this guide:

MS-ESS3-4 Construct an argument supported by evidence for how increases in human population and percapita consumption of natural resources impact Earth's systems. (SEP: 7; DCI: ESS3.C; CCC:Cause/Effect, Technology, Nature Science/Consequence-Actions)

SDBBA2: High School Science Standards

Using this Resource Guide for *SDBBA2*, portions of the following South Dakota Science Standards, adopted by the SD DOE on May 2015, may be met. A teacher's use of this guide may also accomplish other interdisciplinary standards not included in this list.
SD Science Standards http://doe.sd.gov/contentstandards/

High School Life Science Standards included in this guide:

HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (SEP: 2; DCI: LS1.A; CCC: Systems)

HS-LS2-1 Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. (SEP: 5; DCI: LS2.A; CCC: Scale/Prop.)

HS-LS2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. (SEP: 5; DCI: LS2.A, LS2.C; CCC: Scale/Prop.)

HS-LS2-6 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms under stable conditions; however, moderate to extreme fluctuations in conditions may result in new ecosystems. (SEP: 7; DCI: LS2.C; CCC: Stability/Change)

HS-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. (SEP: 6; DCI: LS2.C, LS4.D, ETS1.B; CCC: Stability/Change)

HS-LS4-5 Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. (SEP: 7; DCI: LS4.C; CCC: Cause/Effect)

HS-LS4-6 Use a simulation to research and analyze possible solutions for the adverse impacts of human activity on biodiversity. (SEP: 5; DCI: LS4.C, LS4.D, ETS1.B; CCC: Cause/Effect)

High School Earth Science Standards included in this guide:

HS-ESS3-6 Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. (SEP: 5; DCI: ESS2.D, ESS3.D; CCC: Systems)

SDBBA2: Activities ~ Atlas Scavenger Hunt

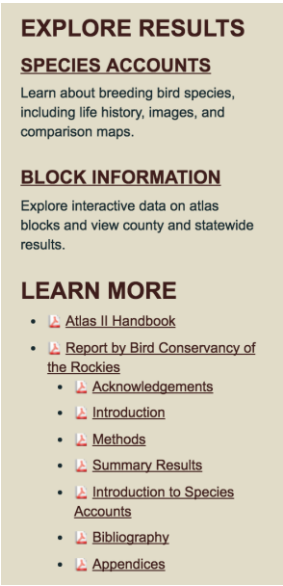
SD SCIENCE STANDARDS Supplemental Science Skills

OBJECTIVES Students will become familiar with the layout and contents of the SDBBA2.

MATERIALS Atlas final draft PDF and interactive website

ACTIVITY IDEAS

1. Student groups compete for accuracy while locating the following items in the Atlas PDF and/or on the interactive website:
2. Printed SDBBA2:
    a. Table of Contents
    b. Map of South Dakota
    c. List of breeding birds found in South Dakota
    d. Description of breeding codes used in the Atlas
    e. Description of habitat codes in South Dakota
    f. Description of methods
    g. Summary of results
    h. Summaries by blocks
    i. Summaries by species
    j. Species safe dates



3. Online Interactive Atlas:
    a. Species Accounts
    b. Block Information
    c. County and block listing
    d. Detailed block information
    e. Species PDF info
    f. Species habitat graphic
    g. Imagery with Labels vs National Geographic
    h. Roads vs satellite image for background
    i. Various Reports for each species
    j. Occupancy and comparison maps by species

4. Students could record some information found in each of the items of the atlas. For example, middle school stu dents could write three pieces of information from each part of the atlas listed in #1.

SDBBA2: Activites ~ Interview with an Atlas Volunteer

STANDARDS Supplemental Science Skills

OBJECTIVES Students and educators will gain background information on atlasing.

ACTIVITY IDEAS Students and educators could read through the following information individually or as a group.

During the five summers working on the SD Breeding Bird Atlas 2, volunteers played a very important role leading to its success. They often chose blocks near their current birding areas as they are local experts for species in those areas. Jocelyn Baker, of Rapid City, shared thoughts on her passion for birds and data collection.

Why did you become a volunteer for the SDBBA2? I live in the area and spend a lot of time birding. I also love surveys and participated in other atlas projects.

Which other breeding bird atlas projects were you a part of? I assisted with the first atlas project in Florida as well as the first in South Dakota.

How long have you been birding? Since the 1970's I have been birding locally as well as traveling to most states and many countries searching for birds I've never seen before.

What was your favorite part of atlasing? It was always exciting finding something that was unexpected. One example was nesting Trumpeter Swans in Pennington County.

How many blocks did you survey? I had four blocks in Pennington County for myself and assisted with others.

What is your favorite habitat to explore? Each different habitat is so unique but I love finding burrowing owls in prairie dog towns. During the summer, the prairie and water areas are filled with breeding birds!

Describe what your ideal day of birding would be like. It would be warm, not too hot, windless, early in the morning, and lots of birds around!

Are there results that are interesting to you? There are many new prairie dog towns with burrowing owls that were not previously located. There was also much more water between 2008 and 2012 than in previous years and even current years resulting in more birds found in those areas.

Why is this data collection so important? We can compare the results from the first atlas 20 years ago to the new one. Changes will be noted, including different species present or absent, as well as habitat changes. One example is the Northeastern Rapid City Block where town is sprawling out into the prairie each year and grassland habitat is lost to buildings, roads, and parking lots.

What is some of your "must have" equipment to use in the field? Binoculars, spotting scope, water, sunscreen, hat, bird books, data sheets, and recordings to confirm the identification of the vocalization of a bird.

How do you hope that people will use the South Dakota Breeding Bird Atlas 2? I hope they will learn what species of breeding birds are in our area and how the habitat they use is important. Some species have specific needs while others can live anywhere in the state. Some species are new to our area and others have disappeared.

What message would you like to share with young birders? Spend more time outside to gain an appreciation for your environment. You can participate in "citizen science" like Christmas Bird Counts and Breeding Bird Surveys. The information gathered is valuable to understand changes in the world around us.

Thank you, Jocelyn, for your lifetime of bird observations and surveys! Your feathered friends thank you as well!

SDBBA2 : Activities ~ The Anatomy of an Atlas

SD SCIENCE STANDARDS Supplemental Science Skills

OBJECTIVES	Students will learn the meaning of the scientific information in the Atlas such as breeding status, behavior, and habitat codes. See the appendices in the final report for more details.
ACTIVITY IDEA	Make a card game like Memory matching the codes with their definitions

Descriptions for O PO PR and CO
Habitat examples, look at habitat photos for visuals of selected habitats listed below.

1. Upland shelter belt
2. Lowland forest, riparian and/or woody draw
3. Shrubland: upland and lowland
4. Grassland: upland and lowland
5. Wetland
6. Open water
7. Cropland
8. Special
    a. Burned
    b. Prairie dog town
    c. Scattered single trees
    d. Badlands and mudflats
9. Human environment
10. Other

Block Identification Codes:

1 R = 1st atlas random block
2 R = 2nd atlas random block
2S = 2nd atlas special block

SDBBA2: Activities ~ Beginning Activity

SD SCIENCE STANDARDS

*Important for all levels to begin learning about the SD Breeding Bird Atlas.
*Use this activity as a foundation for more detailed research.

OBJECTIVES Students will become familiar with birds breeding near their homes by studying nearby atlas blocks, habitats, and the birds within them.

MATERIALS Student data sheet to collect atlas block information

ACTIVITY IDEAS

1. Students pick an atlas block near where they live.
2. Determine what species breed there, either from maps, or online species list for each block.
3. Choose one or more species of bird to learn about and share their information (give websites used)
4. Students determine the habitats present in their block using information from the atlas
5. Student study the block's habitat to determine areas of good vegetation that should be protected. Is it a wetland? A shelterbelt?
6. Students determine if there are any special habitat areas that should be protected for the future.
7. What can be done to ensure the current breeding birds return each year to "your" block?
8. *** Look at the "Full Block Summary Report" and predict what interactions muct occur with the birds found in the block.
9. *** Look at the "Species Accounts" for selected species in your block to determine birds' habitat needs based on their physical characteristics.

SDBBA2: Activities ~ Beginning Activity Data Sheet

County:
Block ID:
Block Name:
Center Coordinates:
Urban or Rural:
Road access type:
Habitats within:
Common birds:
Unique birds:
Interesting features:
Additional notes:

SDBBA2: Activities ~ The Making of the Maps: GPS/GIS/Remote Sensing

SD SCIENCE STANDARDS 3-ESS2-2; 4-ESS2-2

OBJECTIVES Students will study how science and technology can be used to solve problems by creating maps.

MATERIALS Websites listed on this page

ACTIVITY IDEAS

1. Students utilize the listed websites to investigate the current research conducted in South Dakota utilizing GPS, GIS, and remote sensing.
2. Students determine how this technology can assist in the study and management of the breeding bird species in South Dakota.
3. What are some professions that use GIS and GPS?
4. How can this technology solve problems?
5. How do biologists use GIS, GPS and Remote Sensing to make the maps in the Atlas?
6. GIS = software that the GPS data is put into Maps made in GIS have layers that can be shown depending on the purpose of the particular map.
7. How is field data translated to maps? (location and abundance)

Global Positioning Systems: GPS = used to collect the latitude and longitude coordinates. http://www.gps.gov/

National GAP Analysis Project
https://gapanalysis.usgs.gov/data/

USGS Earth Resources Observation and Science (EROS)
http://eros.usgs.gov/

USGS South Dakota Land Cover Images
http://landcover.usgs.gov/southdakota.php

SDBBA2: Activities: South Dakota's Threatened and Endangered Birds

SD SCIENCE STANDARDS MS-LS2-1; HS-LS4-5

OBJECTIVES Students will understand the terms threatened and endangered regarding birds in SD

MATERIALS Internet and SDBBA2 online and PDF

ACTIVITY IDEAS

1. Which of the following threatened and endangered birds breed in South Dakota?
2. What part of SD are they found in?
3. What are their habitat requirements?
4. What is a main cause for each of them to be listed as threatened or endangered?
5. If they are not breeders in SD, then why would we 'list' them in SD?
6. Research the differences between naming a bird as threatened or endangered. Determine why some species are listed in SD but not federally.

SD GFP Threatened and Endangered Species
http://gfp.sd.gov/wildlife/threatened-endangered/threatened-species.aspx

Common Name	**Scientific Name**	**Status**
Peregrine Falcon	*Falco peregrinus*	SE
Whooping Crane	*Grus americana*	LE, SE
Eskimo Curlew	*Numenius borealis*	LE, SE
Interior Least Tern	*Sterna antillarum athalassos*	LE, SE
Piping Plover	*Charadrius melodus*	LT, ST
Osprey	*Pandion haliaetus*	ST
American Dipper	*Cinclus mexicanus*	ST
Rufa Red Knot	*Calidris cantus rufa*	LT

SE = state endangered (in S.D.) ST = state threatened (in S.D.)
LE = federal endangered LT = federal threatened

SDBBA2: Activities ~ Breeding Bird Classification

SD SCIENCE STANDARDS K-ESS3-1; 2-LS4-1; 3-LS3-2; MS-LS4-4; HS-LS1-2

OBJECTIVES Students will study the characteristics of selected breeding birds found in South Dakota by looking at their scientific classification, organization, and categorization.

Students will practice classifying organisms based on their traits of structure and function.

MATERIALS Scientific Classification Table
Animal Photo Card pages

ACTIVITY IDEAS

1. Students locate trends in the classification table then compare and contrast their findings. (Examples: all birds are in the same Kingdom, Phylum, and Class. Some birds all names except a species name, and each bird has a unique scientific name)
2. Teachers could print, laminate and cut the 18 photo cards, making 1 set for each group of students. (paperclip together and store in envelope) Students make a dichotomous key by separating the 18 cards into categories based on physical traits found in the photos.
3. Students compare their criteria for splitting the first few categories of the photo cards with results from other student groups. Were some easier to split that others? What features did you most often use?
4. Looking at the photo cards, can birds' habitat and behavior be hypothesized by their traits? Check the "Species Accounts" (natural history) portion of the SDBBA2 for more information on each species. (Example: Great Blue Heron are adapted to live in wetlands with their long legs.)

SDBBA2: Activities ~ Natural Influences on Habitat and Birds

SD SCIENCE STANDARDS HS-LS2-6; HS-LS4-5

OBJECTIVES Students will study the effects of natural biotic and abiotic factors on habitat and birds' survival.

MATERIALS Internet

ACTIVITY IDEAS

1. Research how prairie bird species are adapted to survive and recover from the following natural occurrences: fire, floods, drought, and grazing pressure.
2. There is a natural wet and dry climate cycle in South Dakota's Great Plains. Determine how wetland birds adapt to this cycle. How do grassland birds adapt? (West River stock dams are important to waterfowl during East River droughts)

SDBBA2: Activities ~ Human Activity Influences on Habitat and Birds

SD SCIENCE STANDARDS K-ESS3-3; 5-ESS3-1; MS-ESS3-4; HS-LS2-7; HS-LS4-6; HS-ESS3-6

OBJECTIVES Students will study the effects of human activity on habitat and birds' survival. Students will identify ways humans have managed lands for habitat preservation.

MATERIALS Internet

ACTIVITY IDEAS

1. Students make a t-chart to list the negative factors of human influence and the possible solutions for each. (Project WILD activities regarding disease, habitat change or decrease, and over harvesting.)

   Negative Human Activities:
   a. Urban Expansion = development decreases habitat for breeding birds. (See the Urban Expansion activity)
   b. Pollution causes bioaccumulation in living things. Food sources such as aquatic insects could be destroyed.
   c. Poaching
   d. Land is changed from rangeland to croplands.

2. Students research more details regarding the positive human influences on the land and bird populations. These activities could maintain breeding populations.

   Positive Human Activities:
   a. Scientists and land managers =
      i. National Wildlife Refuges
      ii. Game Production Areas
      iii. Wildlife Production Areas
   b. Land Owners = manage grasslands and wetlands with wildlife and habitat in mind. Many participate in the Conservation Reserve Program (CRP)
3. Look at the Species Detections by County maps to compare SDBBA1 to SDBBA2

SDBBA2: Activities ~ Urban Expansion Virtual Field Trip

SD SCIENCE STANDARDS K-ESS3-3; 5-ESS3-1; MS-ESS3-4; HS-LS2-1; HS-LS2-2; HS-LS2-7; HS-LS4-6; HS-ESS3-6

OBJECTIVES Students will identify that habitat loss due to human activity is a major problem for birds' breeding success.

MATERIALS Habitat Photos in appendix and from online survey block

ACTIVITY IDEAS

1. Students first define urban expansion and identify some reasons for it.
2. Students identify ways urban expansion affects habitat for birds.
3. Teacher could print habitat photos or project in a larger format so students could discuss what they notice in each of the photos.
4. Students draw human impacts on printed pictures. (houses, cattle, towns, septic, roads)
5. Students notice the erosion patterns in the watershed as seen in the habitat photos. If the area were to be polluted by hazardous liquids, where would it move to? What factors are influenced by the watershed?
6. Students predict how future urban expansion may affect species that are not currently ranked as threatened or endangered in SD.
7. *** Students identify methods of conscientious urban development to minimize the human impact on the environment such as urban planning. Students could design a new residential or shopping area that retains portions of habitats being encroached upon. Is it possible to keep some water, grasslands, or trees within the new development?
8. *** Compare and contrast species of birds in an urban block and an adjacent rural block. Which species in the rural block would disappear if the area were to be influenced by urban expansion?

SDBBA2: Activities ~ Missouri River Habitat Investigation

SD SCIENCE STANDARDS K-ESS3-3; 5-ESS3-1; MS-ESS3-4; HS-LS2-1; HS-LS2-2; HS-LS2-7; HS-LS4-6; HS-ESS3-6

OBJECTIVES Students will study the effects that Missouri River dams could have on breeding birds in South Dakota. Students will also determine effects of human activity, flooding, and other abiotic factors on animal species.

MATERIALS Missouri River Photos in appendix and online survey block

ACTIVITY IDEAS

1. Students use the Least Tern and Piping Plover habitat photos to discuss requirements for their nesting habitat. What human actions could insure continual habitat availability?
2. Students study the invasive species sign and discuss the detriment of those species to the native ones in the Missouri River.
3. Students use the Gavin's Point photo to discuss advantages and disadvantages of dams in the Missouri River in regards to breeding birds.
4. Students use the Endangered Species Habitat sign to discuss the role of educating the public regarding threatened and endangered species found in the area.
5. Students discuss what their role could be in conserving Missouri River habitat for future generations.
6. Flooding: What is the effect on birds? Increased shoreline is good but nests can be washed out but they can rebuild if there is time in the season.
7. Dams releasing water: This floods creeks and rivers but can create more backwater wetland areas.
8. What can be done to decrease habitat loss so that birds continue to breed in that location and be successful? Release water gradually and not during the breeding season? Plant vegetation as a restorative project to prevent damage from flooding?
9. Contact your local resource managers for more information
   - SD GFP, USFS, USGS, USFWS, USACE
10. Students discover more information regarding the Missouri River on the following website: US Army Corps of Engineers: Missouri River Basin http://www.nwd-mr.usace.army.mil/rcc/

SDBBA2: Species List and Scientific Classification

This is a list of birds that should be focused on while completing activities in this guide.
Similar species should be compared by habitat/ranges, common/rare.
Some species will have range changes between atlases.
Some of these species have specific habitat requirements.
Some species hybridize in SD (eastern species with similar western species)

All birds are in Kingdom Animalia, Phylum Chordata, and Class Aves

Common Name	**Order**	**Family**	**Genus**	**species**
Wood Duck	Anseriformes	Anatidae	*Aix*	*sponsa*
Ring-necked Pheasant	Galliformes	Phasianidae	*Phasianus*	*colchicus*
Ruffed Grouse	Galliformes	Phasianidae	*Bonasa*	*umbellus*
Greater Sage-Grouse	Galliformes	Phasianidae	*Centrocercus*	*urophasianus*
Sharp-tailed Grouse	Galliformes	Phasianidae	*Tympanuchus*	*phasianellus*
Greater Prairie-Chicken	Galliformes	Phasianidae	*Tympanuchus*	*cupido*
American White Pelican	Pelecaniformes	Pelecanidae	*Pelecanus*	*erythrorhynchos*
Great Blue Heron	Ciconiiformes	Ardeidae	*Ardea*	*herodias*
Osprey	Falconiformes	Accipitridae	*Pandion*	*haliaetus*
Northern Goshawk	Falconiformes	Accipitridae	*Accipiter*	*gentillis*
Broad-winged Hawk	Falconiformes	Accipitridae	*Buteo*	*platypterus*
Red-tailed Hawk	Falconiformes	Accipitridae	*Buteo*	*jamaicensis*
Virginia Rail	Gruiformes	Rallidae	*Rallus*	*limicola*
Snowy Plover	Charadriiformes	Charadriidae	*Charadrius*	*alexandrinus*
Piping Plover	Charadriiformes	Charadriidae	*Charadrius*	*melodus*
Killdeer	Charadriiformes	Charadriidae	*Charadrius*	*vociferous*
Common Tern	Charadriiformes	Laridae	*Sterna*	*hirundo*
Least Tern	Charadriiformes	Laridae	*Sternula*	*antillarum*
Eurasian Collared-Dove	Columbiformes	Columbidae	*Streptopelia*	*decaocto*
Mourning Dove	Columbiformes	Columbidae	*Zenaida*	*macroura*
Black-billed Cuckoo	Cuculiformes	Cuculidae	*Coccyzus*	*erythropthalmus*
Yellow-billed Cuckoo	Cuculiformes	Cuculidae	*Coccyzus*	*americanus*
Burrowing Owl	Strigiformes	Strigidae	*Athene*	*cunicularia*
Black-backed Woodpecker	Piciformes	Picidae	*Picoides*	*arcticus*
Northern Flicker	Piciformes	Picidae	*Colaptes*	*auratus*
Western Wood-Pewee	Passeriformes	Tyrannidae	*Contopus*	*Sordidulus*
Eastern Wood-Pewee	Passeriformes	Tyrannidae	*Contopus*	*virens*
Western Kingbird	Passeriformes	Tyrannidae	*Tyrannus*	*verticalis*
Eastern Kingbird	Passeriformes	Tyrannidae	*Tyrannus*	*tyrannus*
Gray Jay	Passeriformes	Corvidae	*Perisoreus*	*canadensis*
Blue Jay	Passeriformes	Corvidae	*Cyanocitta*	*cristata*
Black-billed Magpie	Passeriformes	Corvidae	*Pica*	*hudsonia*
Tree Swallow	Passeriformes	Hirundinidae	*Tachycineta*	*bicolor*
Violet-green Swallow	Passeriformes	Hirundinidae	*Tachycineta*	*thalassina*
Red-breasted Nuthatch	Passeriformes	Sittidae	*Sitta*	*canadensis*
White-breasted Nuthatch	Passeriformes	Sittidae	*Sitta*	*carolinensis*
Brown Creeper	Passeriformes	Certhiidae	*Certhia*	*americana*
House Wren	Passeriformes	Troglodytidae	*Troglodytes*	*aedon*
Marsh Wren	Passeriformes	Troglodytidae	*Cistothorus*	*platensis*
American Dipper	Passeriformes	Cinclidae	*Cinclus*	*mexicanus*
Golden-crowned Kinglet	Passeriformes	Regulidae	*Regulus*	*satrapa*
Ruby-crowned Kinglet	Passeriformes	Regulidae	*Regulus*	*calendula*
Eastern Bluebird	Passeriformes	Turdidae	*Sialia*	*sialis*
Mountain Bluebird	Passeriformes	Turdidae	*Sialia*	*currucoides*
Virginia's Warbler	Passeriformes	Parulidae	*Vermivora*	*virginiae*
Spotted Towhee	Passeriformes	Emberizidae	*Pipilo*	*maculatus*

Eastern Towhee	Passeriformes	Emberizidae	*Pipilo*	*erythrophthalmus*
Lark Bunting	Passeriformes	Emberizidae	*Calamospiza*	*melanocorys*
Grasshopper Sparrow	Passeriformes	Emberizidae	*Ammodramus*	*savannarum*
Baird's Sparrow	Passeriformes	Emberizidae	*Ammodramus*	*bairdii*
Lazuli Bunting	Passeriformes	Cardinalidae	*Passerina*	*amoena*
Indigo Bunting	Passeriformes	Cardinalidae	*Passerina*	*cyanea*
LAZB x INBU hybrid	Passeriformes	Cardinalidae	*Passerina*	*amoena x cyanea*
Eastern Meadowlark	Passeriformes	Icteridae	*Sturnella*	*magna*
Western Meadowlark	Passeriformes	Icteridae	*Sturnella*	*neglecta*
Bullock's Oriole	Passeriformes	Icteridae	*Icterus*	*bullockii*
Baltimore Oriole	Passeriformes	Icteridae	*Icterus*	*galbula*
Hybrid – BUOR x BAOR	Passeriformes	Icteridae	*Icterus*	*bullockii x galbula*
Great-tailed Grackle	Passeriformes	Icteridae	*Quiscalus*	*mexicanus*
Common Grackle	Passeriformes	Icteridae	*Quiscalus*	*quiscula*
Lesser Goldfinch	Passeriformes	Fringillidae	*Carduelis*	*psaltria*
American Goldfinch	Passeriformes	Fringillidae	*Carduelis*	*tristis*

Bird photos courtesy of Doug Backlund wildphotosphotography.com

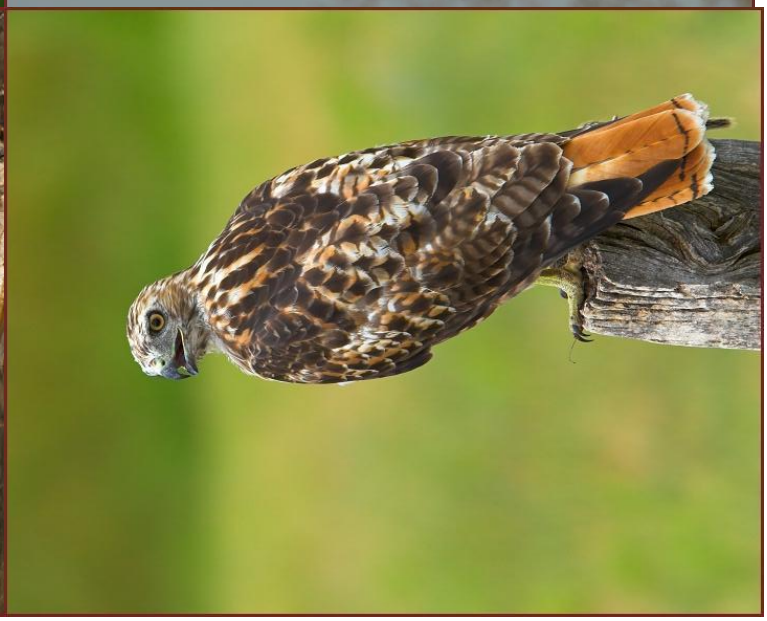
Grasshopper Sparrow
Snowy Plover
Eurasian Collared-Dove
Mourning Dove
Great-tailed Grackle
Red-breasted Nuthatch

Bird photos courtesy of Doug Backlund wildphotosphotography.com

Lazuli Bunting
Ring-necked Pheasant
Killdeer
American Dipper
White-breasted Nuthatch
Spotted Towhee





Bird photos courtesy of Doug Backlund wildphotosphotography.com

Burrowing Owl
Yellow-billed Cuckoo
Great Blue Heron
Indigo Bunting
American White Pelican
Red-tailed Hawk

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Grassland – Hayfield

Meade County, SD

Photo courtesy of Jennifer A. Fowler

Grassland- Pasture

Meade County, SD

Photo courtesy of Jennifer A. Fowler

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Cropland

Meade County, SD

Photo courtesy of Jennifer A. Fowler

Open Water

Big Sioux River along Hwy 13, north of Flandreau in Moody County, SD.

Photo courtesy of Jennifer A. Fowler

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Human Environment

Pennington County, SD

Photo courtesy of Jennifer A. Fowler

Lowland Forest, Woody Draw

Harding County, SD

Photo courtesy of Jennifer A. Fowler

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Special – Badlands

Pennington County, SD

Photo courtesy of Jennifer A. Fowler

Wetland

Meade County, SD

Photo courtesy of Jennifer A. Fowler

Eastern shore of Lake Oahe, north of Pierre, SD.

Rocky and sandy lake shores are nesting sites for Interior Least Terns and Piping Plovers. Do Not Enter signs are posted in the nesting areas.

Photo courtesy of Jennifer A. Fowler

Rocky island in Lake Oahe north of Pierre, SD.

Islands like these are important nesting sites for Interior Least Terns and Piping Plovers.

Photo courtesy of Ricky D. Olson

'Do Not Enter' nesting awareness sign in nesting bird habitat.

Signs like this are posted near Interior Least Tern and Piping Plover nesting sites to deter human disturbances.

Photo courtesy of Carol Aron, USFWS

Invasive species prevention sign along Missouri River.

Eurasian watermilfoil, zebra mussels, and purple loosestrife are invasive species that are prolific in other areas of the United States. Signs like these are aimed to avoid their spread.

Photo courtesy of Jennifer A. Fowler

Endangered Species Habitat Area sign posted at a boat launch along the Missouri River.

Educating the public is an effective way of ensuring the success of endangered species.

Photo courtesy of Jennifer A. Fowler

Gavin's Point Dam on the Missouri River, upstream of Yankton, SD.

Photo courtesy of Jennifer A. Fowler